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ABSTRACT

A study examined evidence of any labor market payoff for school dropouts and if they acquire cognitive skills, and studied whether the payoff differs by gender and race/ethnicity. It analyzed data containing information on the universe of school dropouts in New York and Florida who took the General Educational Development (GED) exams between 1986-90 and were aged 16-21 when they last took those exams. The data--basic demographic information and GED test scores--were merged with Social Security taxable annual earnings via Social Security Numbers. Labor market earnings were measured 5 years after dropouts last attempted the GED exams. Results, based on earnings of 21-26 year-old dropouts who attempted the GED exams in Florida and New York in 1986-90, showed the average annual earnings levels of young dropouts were quite low; in the labor market of the early 1990s, young high school dropouts could expect higher annual earnings if they had higher levels of basic cognitive skills; and females and minority group members had greater returns. The significant economic return to modest skill differences among minority male dropouts shed light on a puzzle in the random-assignment evaluation of the Perry Pre-School Program. (YLB)

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National Center for the Study of Adult Learning and Literacy

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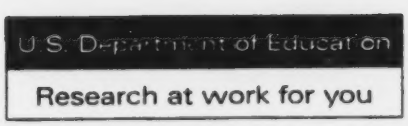

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Executive Summary

Between 1979 and 1996 the median earnings of 25-34 year-old males who left school before obtaining a high school diploma fell by 30 percent; the corresponding figure for female dropouts is a 21 percent decline. Over this same period the earnings premium four-year college graduates received over the earnings of male school dropouts increased from 60 percent to 133 percent. The primary explanation for these patterns is that the demand for unskilled workers declined relative to the demand for skilled workers. While these between-group changes have been well analyzed, little research has examined what is taking place among the least educated in the workforce. Do skills matter among dropouts in this information age economy?

While the average cognitive skill level of school dropouts is quite low, there is considerable variation among dropouts in cognitive skill levels. One could argue that, in an economy in which basic cognitive skills* are increasingly valued, differences in skills would translate into earnings differences for dropouts just as they do for workers with greater educational attainments. On the other hand, the economic trends that have depressed the average earnings of the less skilled may have relegated most young dropouts to entry level jobs where skills matter very little and consequently are not rewarded. This could be especially true for minority male dropouts, whose earnings in 1996 averaged 28 percent less than those of white male dropouts. This report presents evidence on the labor market payoff to cognitive skills for school dropouts, and whether the payoff differs by gender and race/ethnicity.

We analyze data containing information on the universe of school dropouts in New York and Florida who took the GED exams between 1986 and 1990 and were aged 16 to 21 when they last took these exams. The data released to us by the departments of education in these states contain basic demographic information and GED test scores. To obtain an outcome measure, we worked with the Social Security Administration (SSA) to merge the state GED data with Social Security taxable annual earnings via Social Security numbers. These data allow us to address several issues that generally hamper attempts to explore the impact of cognitive skills on labor market performance.

The first problem is that since the test scores that provide the measures of cognitive skills in most data sets are of no consequence to the test-takers, the scores

* Basic cognitive skills are defined here as the reading, writing, and math skills, along with vocabulary and background knowledge, measured by tests such as the GED. Other cognitive skills such as problem solving and oral communication are not part of this analysis.

may provide underestimates of true cognitive skills, especially for individuals who find test-taking distasteful. Our measure of cognitive skills is an individual's scores on the GED exams. Since the GED is a high stakes test for the dropouts in our data, we anticipate that these scores more accurately measure the cognitive skills of the dropouts in our data.

Second, test scores may be correlated with unmeasured variables such as motivation levels which affect labor market performance. Consequently, correlations between test scores and labor market earnings may reflect the importance of unmeasured motivation, rather than the causal impact of cognitive skills. All individuals in our data have exhibited a desire to obtain a GED, as evidenced by their willingness to prepare for and attempt the lengthy battery of tests. Consequently, there is probably less unmeasured variation in motivation among individuals in this data set than is the case among participants in other surveys.

Third, many data sets only have information on wages. As a result individuals who are not working are often excluded from the analysis, giving concern about selection effects associated with who is and is not working. We measure labor market performance by annual earnings. This allows us to include dropouts with zero earnings (those who did not work within the year) in our analysis sample.

Finally, we measure labor market earnings five years after dropouts last attempted the GED exams. This reduces the problem of assessing the direction of causation of the correlation between test scores and earnings.

Our results, based on the earnings of 21-26 year-old dropouts who attempted the GED exams in Florida and New York in the years 1986 to 1990, have both discouraging and encouraging elements as we think about the labor market prospects of young dropouts in the 1990s.

First, our data show that the average annual earnings levels of young dropouts are quite low. Average unconditional earnings for males range from a low of $9,394 in New York in 1995 to a high of $10,869 in Florida in 1995. The comparable figures for females are a low of $6,886 in New York in 1995 and a high of $7,955 in Florida in 1994. Since these averages contain zero earnings for individuals who did not work in a year, they represent the combined effect of wages and labor supply on earnings.

More encouraging news is that for whites and minority-group members, males and females, skills are an important determinant of earnings. Our results show that in the labor market of the early 1990s, young high school dropouts could expect

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higher annual earnings if they had higher levels of basic cognitive skills. Our results also show inter-group variation in the returns to skills, with females generally having higher returns than males, and minority group members, especially those with relatively high skills, having greater returns than white dropouts. For example, among dropouts who scored high enough to be awarded a GED, male and female minority-group members who scored in the upper ranges of the GED had annual earnings in 1995 that were nearly $1,300 to $1,400 dollars higher than lower scoring minority-group members who had a GED. The comparable figure for white females was about $950, and only about $150 (and statistically insignificant) for white males. We also found returns to skills among dropouts whose skills were so low that they were unable to pass the GED exams. Among these lower skilled dropouts the premium for higher GED scores (even though that score was too low to meet the GED passing standard) ranged from about $2,000 for white and minority males to about $3,000 for white and minority females.

The significant economic return to modest skill differences among minority-group male dropouts sheds light on a puzzle in the random-assignment evaluation of the Perry Pre-School Program. As Barnett (1996) has described, black males who participated in the early childhood intervention program did not have greater educational attainments, on average, then did black males in the control group. Yet, the black males in the treatment group did have somewhat higher average earnings at age 27 than did black males in the control group. Barnett speculated that this may have stemmed from the higher average cognitive skills of the treatment group, as measured by test scores during their schooling years. The evidence presented in this paper on the economic returns to skill differences for minority male dropouts supports Barnett's hypothesis.

The research results in this report contain important policy implications. Welfare reform is pushing many low-skilled individuals into a labor market where skills increasingly matter. We find that higher cognitive skills mean higher subsequent earnings for dropouts. This is important information for teachers in GED preparation programs who often face pressure from students to teach to the test at the expense of time spent on skill formation. The message they should impart to there students is passing the GED exam is important, but increasing your skills along the way is also important. However, while our estimates of the returns to skills for many groups are large in percentage terms, we caution that this is largely because these young dropouts have such low average annual earnings to begin with. This is the bad news, and it is a strong argument against a decision to drop out in the first place.

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Cognitive Skills Matter in the Labor Market, Even for School Dropouts

Introduction

Between 1979 and 1996 the median earnings of 25-34 year-old males who left school before obtaining a high school diploma fell by 30 percent; the corresponding figure for female dropouts is a 21 percent decline. Over this same period the earnings premium four-year college graduates received over the earnings of male dropouts increased from 60 percent to 133 percent. The primary explanation for these patterns is that the demand for unskilled workers declined relative to the demand for skilled workers (Gottschalk, 1997; Katz & Murphy, 1992).

While the average cognitive skill level of school dropouts is quite low, there is considerable variation among dropouts in cognitive skill levels. One could argue that, in an economy in which cognitive skills are increasingly valued, differences in skills would translate into earnings differences for dropouts just as they do for workers with greater educational attainments. On the other hand, the economic trends that have depressed the average earnings of the less skilled may have relegated most young dropouts to entry level jobs where skills matter very little and consequently are not rewarded. This could be especially true for minority male dropouts, whose earnings in 1996 averaged 28 percent less than those of white male dropouts. This paper reports evidence on the labor market payoff to cognitive skills for school dropouts, and whether the payoff differs by gender and race/ethnicity.

Several problems hamper attempts to explore the impact of cognitive skills on labor market performance. First, since the test scores that provide the measures of cognitive skills in most data sets are of no consequence to the test-takers, the scores may provide underestimates of true cognitive skills, especially for individuals who find test-taking distasteful. Second, the test scores may be correlated with unmeasured variables such as motivation levels which affect labor market performance. Consequently, correlations between test scores and labor market earnings may reflect the importance of unmeasured motivation, rather than the causal impact of cognitive skills. Third, many studies measure labor market performance by hourly wage. This excludes from the analysis those individuals who are unable to find work as a result of low cognitive skill levels. Finally, some data sets, such as the National Adult Literacy Survey, include only contemporaneous information on cognitive skills and wages. This makes it

difficult to identify causation. It may be that individuals who obtain well paying jobs for reasons unrelated to cognitive skill levels receive training that results in relatively high skill levels.

We examine the returns to cognitive skills using a data set that responds to the problems listed above. This data set consists of information on a sample of individuals who dropped out of school and later attempted to acquire a General Educational Development (GED) credential. While this is not a random sample of all dropouts, data on these individuals do offer a number of advantages. First, our measure of skills for these individuals is their standing on the GED exams, a seven and one-half hour battery of exams covering mathematics, writing, reading, social studies, and science. The GED exams represent a high-stakes test for the members of our sample. As a result, we expect that individuals approach the tests with seriousness and effort, and hence scores on these exams better measure underlying true skills than test scores in other data sets. Second, all individuals in our data have exhibited a desire to obtain a GED, as evidenced by their willingness to prepare for and attempt the lengthy battery of tests. Consequently, there is probably less unmeasured variation in motivation among individuals in this data set than is the case among participants in other surveys. Third, we measure labor market performance by annual earnings. This allows us to include dropouts with zero earnings in our analysis sample. Finally, we measure labor market earnings five years after dropouts last attempted the GED exams. This reduces the problem of assessing the direction of causation of the correlation between test scores and earnings.

We discuss the unique nature of our data in the next section, and we turn to our methodology in Section 3. In Section 4 we present and discuss our results, and we show that skills do matter for young dropouts, white and minority, male and female.

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Data

We analyze data containing information on the universe of dropouts in New York and Florida who took the GED exams between 1986 and 1990 and were aged 16 to 21 when they last took these exams. The data released to us by the departments of education in these states contain basic demographic information and GED test scores. To obtain an outcome measure, we worked with the Social Security Administration (SSA) to merge the state GED data with Social Security taxable annual earnings via Social Security numbers. As detailed by Angrist (1997), SSA earnings data such as those released to us have a number of limitations.[1] One important limitation is that for confidentiality reasons, the SSA does not release individual earnings to researchers. Rather, they release aggregated data based on directions supplied by the researcher. Because the SSA will only release aggregate data, we are only able identify individuals as "white, non-Hispanic" or as "other than white, non-Hispanic." For ease of exposition we call these two groups "whites" and "minorities."

SSA aggregation guidelines also preclude us from retaining continuous GED score information. As a result, we retain GED test score information in our data by constructing ten "score group" categories that reflect unique combinations of overall mean scores on the five tests in the GED battery and minimum scores out of the five tests. While the relationship between these score groups is not cardinal in nature, the score groups are ordinal and monotonic. Thus, a higher score group represents a higher mean score, a higher minimum score, or both, and hence, a higher level of measured skills.[2] The construction of these GED test score groups is displayed in Figure 1.

[1] Limitations regarding top coding, covered occupations, and other aspects of the SSA earnings records are discussed by us in Tyler, Murnane, and Willett (Tyler, Murnane, and Willett 1998). Our overall conclusion is that these limitations do not provide serious problems for this research.

[2] This is true except for the range around score groups 3 and 4. Individuals in score group 3 have lower mean scores than those in score group 4, but higher minimum scores (see Figure 1). Thus, it is not clear which group has higher overall skill levels.

Figure 1. GED score groups formed from combinations of minimum and mean scores.

Minimum Score	Mean Score	
	<45	>=45
20-34	Scoregrp 1	
35-39	Scoregrp 2	Scoregrp 4
40-44	Scoregrp 3	Scoregrp 5
45-46		Scoregrp 6
47-48		Scoregrp 7
49-50		Scoregrp 8
51-52		Scoregrp 9
53+		Scoregrp 10

The rows in Figure 1 represent successively higher minimum score intervals. The minimum score intervals are 5 points at the bottom end of the range and 2 points at the upper end. The two columns in Figure 1 represent the two ranges of the mean score we use: less than a 45 mean score and a mean score of 45 or higher. We include in our models dichotomous indicators of 9 of the 10 score groups and interactions between each of the score group indicators and other variables of substantive interest.

The cells in our data are defined by state (Florida or New York), year-of-test (1986-1990), GED score group (1-10), gender, and race/ethnicity (white or minority). For each cell the SSA released the mean earnings in the cell, the standard deviation of earnings, and the cell frequency.

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Table 1. Proportion of GED testers age 16-21 who attempted the battery in the years 1986-1990 in Florida and New York, by gender, race, and GED score group.

	FL	NY
Proportion who are...		
in ..	0.46	0.53
male	0.55	0.56
white	0.76	0.57
Proportion in...		
Score group 1	0.04	0.06
Score group 2	0.07	0.09
Score group 3	0.03	0.04
Score group 4	0.007	0.01
Score group 5	0.32	0.33
Score group 6	0.14	0.13
Score group 7	0.11	0.10
Score group 8	0.10	0.08
Score group 9	0.08	0.06
Score group 10	0.12	0.10

As indicated in Table 1, 46 percent of the individuals in the data set attempted the GED tests in Florida and 53 percent in New York. The proportion male is about the same in both states and is slightly higher than the proportion female. The sample from Florida is substantially more white than the sample from New York. The distribution across the GED score groups is similar in the two states, with Florida having a slightly higher percentage of dropouts scoring in the three highest score groups.

Table 2 provides information for males on mean annual earnings (in 1995 constant dollars[3]) five years after each cohort last took the GED exams. Table 3

[3] All earnings in the data are converted to 1995 constant dollars using the Consumer Price Index-All Urban Consumers (CPI-U) index.

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provides the analogous information for females.[4] The entries in these two tables show that the annual earnings of young dropouts are quite low, on average, regardless of the state or year. These low mean earnings suggest that young dropouts are either employed in very low wage jobs, are often without employment (i.e., their mean earnings are zero), or both.

Table 2. Mean earnings (1995 $), for young male dropouts by state and year (1991-1995).

	Year Earnings Measured				
State	1991	1992	1993	1994	1995
FL	10710	10445	10545	10477	10869
NY	10629	9985	9807	9916	9394

Table 3. Mean earnings (1995 $), for young female dropouts by state and year (1991-1995).

	Year Earnings Measured				
State	1991	1992	1993	1994	1995
FL	7875	7735	7833	7955	7707
NY	7896	7600	7301	7172	6886

[4] The lower unconditional mean earnings in New York, generally considered a high wage state relative to Florida, is at least in part due to the higher percentage of minority dropouts in New York. In other data available to us, however, we observe that the lower New York mean earnings are also due to a higher presence of zeros in the cells, as the mean of *positive* earnings is higher in New York than Florida.

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Statistical Analysis

Analytic Model

The data we use to examine the returns to skills for our sample of young dropouts consist of 635 cells as described earlier. We are interested in y_{ic}, the true earnings of the i_{th} person in the c_{th} cell. However, as a result of the nature of the data released to us by the Social Security Administration, we only have a sample estimate of the mean earnings, μ_c, in the c_{th} cell. We assume that $y_{ic} = \mu_c + w_{ic}$ where $w_{ic} \sim N(0, \eta^2)$.

We would like to examine the relationship between skills and earnings by fitting a series of models in which the dependent variable is the cell population mean earnings μ_c, and the explanatory variables of primary interest are the GED score group and score group-demographic group interactions associated with individuals who make up the c_{th} cell. Our model is:

(1)

$$\mu_c = \beta_0 + \beta_1 female_c + \beta_2 minority_c + \beta_3 state_c + \beta_4 (minority_c * female_c) + \beta_5 (minority_c * state_c) + \alpha_1 sg_c + \alpha_2 (sg_c * female_c) + \alpha_3 (sg_c * minority_c) + \alpha_4 (sg_c * female_c * minority_c) + \gamma_1 cohort_c + \gamma_2 cohort_c^2 + \gamma_3 ue_c + v_c$$

where c indexes cell and,

female = 1 if the c_{th} cell is composed of females.
minority = 1 if the c_{th} cell is composed of dropouts who are minority,
state = 1 if the c_{th} cell is composed of dropouts who took the tests in New York
sg = a vector of 9 dummy variables indicating whether the c_{th} cell contains dropouts in score group 2 or score group 3 or .up to score group 10
cohort = 0 if individual *i* is in the 1986 testing cohort (and thus has earnings measured in 1991), 1 if in the 1987 cohort, ..., and 4 if in the 1990 cohort.[5]

[5] In preliminary data analyses we are unable to reject the null hypothesis that the earnings of white and minority females are jointly equal in New York and Florida, once we allow for a main effect of state on earnings and allow the earnings of all minority-group members to be different in the two states. We are also unable to reject the null hypothesis that the joint effect of all the score group dummies is the same across Florida and New York. Preliminary data analysis also indicates that the effect of being in the various cohorts is the same by gender and by race/ethnicity.

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ue = the state unemployment rate in state j and year k for 18-30 year-olds with only a high school diploma, GED, or 0 to 11 years of schooling, and

v = a mean zero error term, assumed to be uncorrelated with the other regressors.

The α's, β's, and γ's in Equation 1 are parameters to be estimated. In particular, the α parameters answer our main research questions. We control for state effects by including a dummy for New York in the model. The inclusion of the *minority*state* interaction further allows the earnings of minority dropouts to be different across Florida and New York.[6] We control for secular labor market trends in the years 1991-1995 by including the state-specific unemployment rates for 18-30 year-olds with a high school degree or less.

Because individuals in score groups 5-10 have a GED in both Florida and New York, while individuals in lower score groups do not (i.e., individuals in these score groups scored too low to pass the GED exams), the estimates on all of the parameters associated with score groups 5-10 measure the effect of skills on earnings plus any additional effect of the GED on earnings.[7] By looking at the returns to skills within the 1-4 and the 5-10 groups separately, we can isolate the effect of skills on earnings from the impact of the GED credential on earnings.

Estimation

We do not know the population μ's, but we possess the sample estimates, $\hat{\mu}$, provided by the Social Security Administration. We assume that

$$\hat{\mu}_c = \mu_c + u_c \qquad u_c \sim N(0, \xi^2)$$

In our estimation we must account for the fact that the μ_c's are estimated with varying precision.

[6] We are unable to reject the null hypothesis that the earnings of white females are the same in the two states once we control for overall state effects (p=0.505), nor can we reject the null on a test that the joint effect of the score group dummies is the same in the two states (p=0.950).

[7] Tyler, Murnane, and Willett (1998) find an effect of the GED on earnings that is independent of the effect of cognitive skills for dropouts just at the margin of passing the exams.

We want to fit Equation 1, which we will represent here as:

$$\mu_c = x_c\delta + v_c,$$

where x is a vector of the independent variables and δ is a vector of regression parameters to be estimated. However, because the μ_c are unknown we must instead fit the following model:

Assuming that u and v are independent, that $E[vv'] = \sigma^2\mathbf{I}$, and that

$$E[u_m u_n] = \begin{cases} \omega^2, m=n \\ 0, \quad m\neq n \end{cases}, \qquad where\,\omega^2 = \frac{\eta_c^2}{n_c},$$

with n_c the cell frequency in the c_{th} cell, we have

(2)

$$\hat{\mu}_c = x_c\delta + (v_c + u_c) = x_c\delta + \varepsilon_c$$

$$E[\varepsilon\varepsilon'] = \sigma^2\Omega = \sigma^2\begin{bmatrix} \frac{\sigma^2+\omega_1^2}{\sigma^2} & 0 & \cdots & 0 \\ & \ddots & & \vdots \\ & & \ddots & \\ & & & \frac{\sigma^2+\omega_c^2}{\sigma^2} \end{bmatrix}$$

where C is the total number of cells.

Efficient estimation of δ in Equation (2) requires a consistent estimate of Ω, which, in turn, requires estimates of each ω_c^2 and of σ^2. Estimates of the ω_c^2 are obtained by using the cell variances (supplied by the SSA) to estimate the η_c^2, in combination with the cell frequencies n_c (also supplied by the SSA). Following Hanushek (1974), we use a two-step estimator for σ^2. We then use our estimate of Ω to form a Weighted Least Squares (WLS) fit of the model in Equation (1).

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Results

Table 4 presents WLS estimates for the parameters of Equation (1). Given the parameterization of Equation (1), the estimate of the intercept in Table 4 indicates that the average annual earnings of young white male dropouts in score group 1 in Florida who tested in 1986 were about $9,665.[8] The earnings of comparable white females averaged about $4,200 less than this, and those of minority males in the same state, score group, and cohort were about $1,240 less. Meanwhile, comparable minority females earned about $3,300 less (-4190-1241+2129) than the baseline group. The estimate of the coefficients on the *state* and the *minority*state* variables indicate that minority dropouts tended to make about $659 (121-780) less per year in New York than in Florida.

Table 4. Weighted-least-squares estimates of Equation (1).

(Standard errors in parentheses with p<0.10=~, p<0.05=* and p<0.01=**. Estimates are over 635 cells containing 174,125 individual observations.)

		*Female*score group interactions*	*minority*score group interactions*	*female*minority* score group interactions*
intercept	9665**			
	(380)			
female	-4190**			
	(306)			
minority	-1241**			
	(312)			
state	121			
	(105)			
*minority*female*	2129**			
	(420)			

[8] The effect of *ue* (the unemployment rate) on this cohort in Florida would subtract another $731 from this estimate. For ease and clarity of exposition we abstract away from this effect on earnings in this part of the discussion.

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*minority*state*	-781**			
	(132)			
score group 2	1068**	-193	-393	404
	(299)	(41)	(417)	(572)
score group 3	1887**	-708	-883~	1154~
	(335)	(450)	(480)	(647)
score group 4	1205*	-1132~	411	1106
	(467)	(612)	(702)	(937)
score group 5	2358**	502	-535	547
	(257)	(357)	(360)	(499)
score group 6	2554**	726~	-138	-42
	(275)	(382)	(400)	(555)
score group 7	2717**	934*	234	-42
	(279)	(387)	(416)	(582)
score group 8	2474**	1464**	596	-281
	(285)	(394)	(437)	(615)
score group 9	2839**	1395**	1168*	-860
	(301)	(416)	(488)	(685)
score group 10	2776**	1716**	1171**	-420
	(284)	(397)	(441)	(630)
cohort	-245**			
	(81)			
*cohort*2*	33~			
	(19)			
ue	-62*			
	(25)			

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As stated earlier, parameters answering our primary research questions are the coefficients associated with the score group dummies and with the score group-demographic group interactions. Since the relationship of the score groups to one another is monotonic, we should see a pattern indicating that higher earnings are associated with higher score groups (except perhaps for the increment from score group 3 to score group 4). Looking down the list of estimated coefficients on the main-effect score group dummies, we see that in all but two cases this pattern holds true.[9] Thus, for white males the pattern indicates that higher earnings are associated with higher GED scores. This pattern also holds for the other three demographic groups represented in the data: minority males, white females, and minority females.[10]

To clarify the returns to skills indicated by the estimates in Table 4, we tested a series of hypotheses regarding different score group-earnings relationships. First, we wanted to know if there was an overall increase in earnings associated with higher GED scores. To test this hypothesis, we compared the average earnings of individuals in the highest score groups (score groups 5-10) to the earnings of individuals in lowest score groups (groups 1-4). We chose these combinations of score groups because they represent a comparison of GED-holders versus non-GED holders. That is, as stated earlier, individuals in both states in score groups 5 and higher had scores high enough to be awarded a GED, while those in score groups 4 and lower failed the GED exams. To examine the overall returns to skills plus a GED for our sample of dropouts we conducted the following contrast for all four demographic groups,

Contrast 1

$$\left(\frac{\hat{y}_{10}+\hat{y}_9+\hat{y}_8+\hat{y}_7+\hat{y}_6+\hat{y}_5}{6}\right)-\left(\frac{\hat{y}_4+\hat{y}_3+\hat{y}_2+\hat{y}_1}{4}\right)$$

where each $\hat{y}$ represents the estimated population mean earnings in the corresponding score

group based on the estimates in Table 4. This contrast answers the question, do

[9] While the point estimate drops from score group 3 to score group 4 (1887 to 1205) and score group 9 to score group 10 (2839 to 2776), we are unable in each case to reject the null hypothesis that the estimates are equal.

[10] The only instance where there is a decline in the earnings-score group relationship between successively higher score groups *and* where we can reject the null of equality is between score groups 3 and 4 for white females.

higher skilled young dropouts earn more on average than lower skilled young dropouts?

To analyze in greater detail the skill-earnings relationship, we examined potential returns to skills for the lowest-skilled dropouts in our data (those in score groups 1-4), as well as the returns to skills for the highest skilled dropouts (those in score groups 5-10). For the low-skilled dropouts we compared the earnings of those in score groups 3 and 4 with the earnings of those in score groups 1 and 2. For the high skilled dropouts we compared the earnings of those in score groups 8-10 with the earnings of dropouts in score groups 5-7. Those two contrasts were conducted in the following manner:

Contrast 2

$$\left(\frac{\hat{y}_4 + \hat{y}_3}{2}\right) - \left(\frac{\hat{y}_2 + \hat{y}_1}{2}\right) \text{ for low skilled dropouts}$$

Contrast 3

$$\left(\frac{\hat{y}_{10} + \hat{y}_9 + \hat{y}_8}{3}\right) - \left(\frac{\hat{y}_7 + \hat{y}_6 + \hat{y}_5}{3}\right) \text{ for high skilled dropouts}$$

The results of these contrasts for the four demographic groups in our study, along with the p-values from the relevant hypothesis tests for equality, are presented in Table 5.

Table 5. Earnings contrasts across skill levels by demographic group, five years after last taking GED exams. (p-values for the relevant F-tests within parentheses, and p<0.01==**, p<0.05=*.)

	Contrast Estimates			
	white males	minority males	white females	minority females
Contrast 1 *"gross" returns to skills + GED*	1580** (p=0.000)	2212** (p=0.000)	3211** (p=0.000)	2995** (p=0.000)
Contrast 2 *Returns to low-level skills*	1012** (p=0.000)	973** (p=0.002)	189 (p=0.438)	1078** (p=0.000)
Contrast 3 *Returns to high-level skills*	153 (p=0.279)	1279** (p=0.000)	958** (p=0.000)	1408** (p=0.000)

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The F-test in Contrast 1 is whether

$$\left(\frac{\hat{y}_{10}+\hat{y}_9+\hat{y}_8+\hat{y}_7+\hat{y}_6+\hat{y}_5}{6}\right)=\left(\frac{\hat{y}_4+\hat{y}_3+\hat{y}_2+\hat{y}_1}{4}\right)$$ in this group.

The F-test in Contrast 2 is whether $\left(\frac{\hat{y}_4+\hat{y}_3}{2}\right)=\left(\frac{\hat{y}_2+\hat{y}_1}{2}\right)$ within this group.

The F-test in Contrast 3 is whether $\left(\frac{\hat{y}_{10}+\hat{y}_9+\hat{y}_8}{3}\right)-\left(\frac{\hat{y}_7+\hat{y}_6+\hat{y}_5}{3}\right)$ within this group.

Row 1 in Table 5 shows the results from Contrast 1, the difference between the average earnings of high skilled dropouts and those of low skilled dropouts, in each of the four demographic groups. The entries in this first row indicate that all four demographic subgroups realize substantial returns to higher GED scores, to acquisition of a GED, or to both. Furthermore, these returns are greater for females than for males.[11] Given the increase during the 1980s in the gap between the earnings of white males and those of black males (Bound and Freeman 1992), it is notable that the economic return to skills is larger for minority males than for white males.[12]

A second question addressed in Table 5 is whether or not young dropouts experience returns to skills even within more narrowly defined ranges of skills. Looking within more narrowly defined skill groups also has the advantage of allowing us to examine the returns to skills while controlling for the separate effect of GED acquisition on earnings. The second row of Table 5 shows the results from Contrast 2, the returns to skills for low skilled dropouts, and the third row gives the results from Contrast 3, the returns for high skilled dropouts. The results in these rows indicate that even within narrowly defined ranges, dropouts with higher GED scores experience higher earnings. Moreover, with two exceptions, the economic returns to small differences in measured skills are statistically significant and substantial, with higher scores translating into about $1,000 to $1,400 more per year in earnings. The two exceptions are Contrast 3 for

[11] We can reject the hypothesis that Contrast 1 for white males = Contrast 1 for white females (p=0.000) and that Contrast 1 for minority males = Contrast 1 for minority females (p=0.002).

[12] We can reject the hypothesis that Contrast 1 for white males = Contrast 1 for minority males (p=0.008). We cannot reject the hypothesis that Contrast 1 for white females = Contrast 1 for minority females (p=0.339).

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white males and Contrast 2 for white females.

The next step is to formally examine differences in the returns to skills across the demographic groups. If we focus only on the inter-group contrasts that are statistically significant at the 0.05 level, the following patterns emerge. First, skills plus a GED (as captured in Contrast 1) matter more for females than for males and slightly more for minority-group members than for whites. The average difference between Contrast 1 for females and Contrast 1 for males indicates that the returns to skills plus a GED are about $1,200 greater for females than for males.[13] A similar comparison across race/ethnicity groups indicates that the average return to skills plus a GED is about $208 greater for minority-group members than for whites.[14]

The story regarding returns to low-level skills is somewhat different. The figures in row 2 of the table indicate that returns to low-level skills are about the same (approximately $1,000) for all groups except for white females.[15]

Row 3 indicates that among higher skilled dropouts who all had a GED, higher scores means higher earnings for all groups except young white males. Also, among the three groups exhibiting statistically significant returns to higher skills, the returns are the greatest for minority dropouts.[16]

In summary, three central stories emerge from an examination of the returns to skills within narrowly defined gender, race/ethnicity, and skill categories. First, among individuals in almost every demographic-skill group, greater cognitive skills as measured by GED exam scores led to substantially higher earnings five years later. The exceptions are the highest skilled white male dropouts and the

[13] p=0.000 in a test that the average of cells 1 and 2 equals the average of cells 3 and 4 in row 1.

[14] p=0.000 in a test that the average of cells 1 and 3 equals the average of cells 2 and 4 in row 1. Tyler, Murnane, and Willett (1998) find that, controlling for skills, GED acquisition is much more important for young white dropouts on the margin of passing than for young minority dropouts on the margin of passing. Reconciliation of those results with the results in this current study means that: (1) the "gross" returns to skills for minority dropouts are substantially higher than for white dropouts, (2) the returns to a GED for highly skilled minority dropouts are greater than the returns to similarly skilled white dropouts, or (3) both (1) and (2) are true.

[15] We reject the null in all comparisons with white females in row 2, and we cannot reject the null in any of the comparisons between the other three groups in row 2.

[16] p=0.051 on a test that the average of cells 2 and 4 equals cell 3 in row 3. However, we cannot reject the nulls that cell 2 equals cell 3, that cell 4 equals cell 3, or that jointly cells 2 and 4 equal cell 3.

lowest skilled white female dropouts. Second, we do not find that young minority dropouts are being relegated to jobs where skills do not matter. In fact, even among the least skilled minority male and female young dropouts, higher GED scores mean substantially higher earnings. Finally, not all GED holders are treated the same in the labor market. That is, except for white males, higher scoring GED holders earn substantially more than lower scoring GED holders, and the returns to skills are largest for young minority GED holders.

A fair question is whether the patterns displayed in Table 5 are different across Florida and New York. In a model that includes all of the relevant state interactions, we can reproduce tables similar to Table 5 separately for the dropouts who attempted their GED in Florida and those who attempted their GED in New York. Doing this and comparing the twelve contrast by demographic group cells as represented in Table 5, we can reject the hypothesis that the relevant contrast in Florida equals the same contrast in New York in only two of the twelve instances. In particular, we can reject that Contrast 1 and Contrast 3 for minority males in Florida and New York are equal. In each of these two contrasts, the returns for minority males are higher in Florida than in New York. Thus, except perhaps for minority males, Table 5 is a good representation of the returns to skills five years after last taking the GED exams for young dropouts in both Florida and New York in the first half of the 1990s.[17]

One final question of interest concerns the importance of age. Would the returns to skill be the same if earnings were measured when the dropouts were younger? To answer this question, we replicated our analyses using as the dependent variable annual earnings (in 1995 dollars) one year after the dropouts in the sample last took the GED exams. Table 6, which is identical in structure to Table 5, provide a summary of the results. Just as when the dropouts were four years older (Table 5), skill differences are associated with statistically significant earnings differences in all but two of the contrasts. However, the magnitudes of the earnings differences associated with skill differences are, on average, about half as large among 17-22 year-old dropouts as they are among the same groups when they are four years older. That the returns to cognitive skills increase with age is a pattern also found in other studies (Altonji and Pierret 1996; Farber and Gibbons 1996).

[17] The two entries for which we can reject the null of equality between the states suggest the following situation: minority males in Florida enjoy higher overall returns to skills than minority males in New York because more highly skilled minority males in Florida have significantly greater returns than do more highly skilled minority males in New York.

Table 6. Earnings contrasts across skill levels by demographic group, one year after last taking GED exams

	Contrast Estimates			
	white males	minority males	white females	minority females
Contrast 1 *"gross" returns to skills + GED*	557** (p=0.000)	692** (p=0.000)	1726** (p=0.000)	1326** (p=0.000)
Contrast 2 *returns to low-level skills*	694** (p=0.000)	491** (p=0.030)	334* (p=0.070)	543** (p=0.010)
Contrast 3 *returns to high-level skills*	-22 (p=0.830)	774** (p=0.000)	450** (p=0.000)	999** (p=0.000)

Conclusion

This study uses a unique, new data set to examine the relationship between the skills that young dropouts bring to the labor market and their annual earnings. Our results, based on the earnings of 21-26 year-old dropouts who attempted the GED exams in Florida and New York in the years 1986 to 1990, have both discouraging and encouraging elements as we think about the labor market prospects of young dropouts in the 1990s.

First, our data show that the average annual earnings levels of young dropouts are quite low. Average unconditional earnings for males range from a low of $9,394 in New York in 1995 to a high of $10,869 in Florida in 1995. The comparable figures for females are a low of $6,886 in New York in 1995 and a high of $7,955 in Florida in 1994. Since these averages contain zero earnings for individuals who did not work in a year, they represent the combined effect of wages and labor supply on earnings.

More encouraging news is that for whites and minority-group members, males and females, skills are an important determinant of earnings. Our results show that in the labor market of the early 1990s, young high school dropouts could expect higher annual earnings if they had higher levels of basic cognitive skills. Our results also show inter-group variation in the returns to skills, with females generally having higher returns than males, and minorities, especially high skilled minority-group members, having greater returns than white dropouts.

The significant economic return to modest skill differences among minority male dropouts sheds light on a puzzle in the random-assignment evaluation of the Perry Pre-School Program. As Barnett (1996) has described, black males who participated in the early childhood intervention program did not have greater educational attainments, on average, then did black males in the control group. Yet, the black males in the treatment group did have somewhat higher average earnings at age 27 than did black males in the control group. Barnett speculated that this may have stemmed from the higher average cognitive skills of the treatment group, as measured by test scores during their schooling years. The evidence presented in this paper on the economic returns to skill differences for minority male dropouts supports Barnett's hypothesis.

Welfare reform is pushing many low-skilled individuals into a labor market where skills increasingly matter. Our research, which measures skills with a high-stakes test (the GED exams) and earnings with reliable administrative data (Social Security earnings), shows that higher cognitive skills mean higher subsequent earnings for dropouts. This is the good news. However, while our estimates of the returns to skills for many groups are large in percentage terms, we caution that this is largely because these young dropouts have such low average annual earnings to begin with. This is the bad news, and it is a strong argument against a decision to drop out in the first place.

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